

CHAPTER 2**AIR EMISSIONS****2-1 SCOPE**

This Chapter contains criteria for air emissions and performance standards applied to Department of Defense owned and operated equipment. The performance standards cover fossil-fuel-fired steam generators, hot-water generating plants, electric utility steam generators and incinerators. These standards include monitoring and data collection requirements. Motor vehicles, Ozone Depleting Substances (ODS), and Volatile Organic Compounds (VOC) are also addressed. Units less than 100,000 BTU/hr heat input are not covered under these criteria. Criteria addressing open burning of solid waste are contained in Chapter 7.

2-2 DEFINITIONS

2-2.1 Coal Refuse. Waste products of coal mining, cleanings and coal preparation operations (e.g., culm, gob, etc.) containing coal, matrix material, clay, and other organic and inorganic material.

2-2.2 Electric Utility Steam Generating Unit. Any furnace, boiler, or other device used for combusting fuel for the purpose of producing steam to generate electricity.

2-2.3 Fossil Fuel. Natural gas, petroleum, coal, and any form of solid, liquid or gaseous fuel derived from such material for the purpose of creating useful heat.

2-2.4 Incinerator. Any furnace used in the process of burning solid or liquid waste for the purpose of reducing the volume of the waste by removing combustible matter, including equipment with heat recovery systems for either hot water or steam generation.

2-2.5 Non-Tactical Vehicles. Commercially-available vehicles that are adapted to military use.

2-2.6 Offensive Odor Substances. Ammonia, methyl mercaptan, and other substances as described in Japanese Offensive Odor Control Law (1971) as likely to cause unpleasant odors and disrupt the living environment.

2-2.7 Ozone Depleting Chemicals (ODC) or Substances (ODS). Those substances listed in Table 2-1A and 2-1B.

2-2.8 Potential Combustion Concentration. Theoretical emissions that would result from combustion of a fuel in an uncleaned state without emission control systems.

2-2.9 Steam Generating Unit. Any furnace, boiler, or other device used for combusting fuel for the purpose of producing steam (including fossil-fuel-fired steam generators associated with the combined cycle of gas turbines; nuclear steam generators are not included).

2-2.10 Substantially Modified. Define as significant net increase in emissions, and larger than 50% of replacement cost.

2-2.11 Wood Residue. Bark, sawdust, slabs, chips, shavings, mill trim, and other wood products derived from wood processing and forest management operations.

2-3 CRITERIA

2-3.1 New or Substantially Modified (N/SM) Fossil-Fuel-Fired Steam Generating Units. These criteria apply to all new or substantially modified fossil fuel fired steam generating units rated greater than 100 million BTU/hr heat input.

- a. No flue gas discharged into the atmosphere will contain particulate matter in excess of 43 nanograms per joule heat input (0.10 lb. per million BTU) derived from fossil fuel or fossil fuel and wood residue.
- b. No flue gas discharged into the atmosphere will exhibit greater than 20 percent opacity except for one six-minute period per hour of not more than 60 percent opacity.
- c. No flue gas discharged into the atmosphere will contain sulfur dioxide in excess of 340 nanograms per joule heat input (0.80 lb. per million BTU) derived from liquid fossil fuel or liquid fossil fuel and wood residue.
- d. No flue gas discharged into the atmosphere will contain sulfur dioxide in excess of 520 nanograms per joule heat input (1.2 lb. per million BTU) derived from solid fossil fuel or solid fossil fuel and wood residue.
- e. No flue gas discharged into the atmosphere will contain nitrogen oxide in excess of:
 - (1) 86 nanograms per joule heat input (0.20 lb. per million BTU) derived from gaseous fossil fuel.
 - (2) 129 nanograms per joule heat input (0.30 lb. per million BTU) derived from liquid fossil fuel, liquid fossil fuel and wood residue or gaseous fossil fuel and wood residue.
 - (3) 300 nanograms per joule heat input (0.70 lb. per million BTU) derived from solid fossil fuel or solid fossil fuel and wood residue.
 - (4) 260 nanograms per joule heat input (0.60 lb. per million BTU) derived from lignite or lignite and wood residue.
- f. Low excess air/low NO_x burners will be used in new construction and major modification if these burners are compatible with existing combustion configuration as determined by the burner manufacturer or the combustion/professional engineer.
- g. When a fossil fuel containing at least 25 percent by weight of coal refuse is burned in combination with gaseous, liquid, other solid fossil fuel or wood residue, the criteria for NO_x established in paragraph 2-3.1.f will not apply.
- h. Fuel sulfur content will not exceed 0.5% by weight. Fuel sulfur content will be measured and recorded for each fuel batch.
- i. Activities will record ash contents and higher heating value for the fuel combusted in the source. Activities can refer to the fuel analysis of the fuel supplier.

2-3.2 New or Substantially Modified Electric Utility Steam Generating Units. These criteria apply to N/SM electric utility steam generating units rated greater than 100 million BTU/hr heat input.

- a. No flue gas discharged into the atmosphere will contain particulate matter in excess of 13 nanograms per joule heat input (0.03 lb. per million BTU) derived from the combustion of solid, liquid, or gaseous fossil fuel.

- b. No flue gas discharged into the atmosphere will exhibit greater than 20 percent opacity, except for one six-minute period per hour of not more than 30 percent opacity.
- c. No flue gas discharged into the atmosphere will contain in excess of 520 nanograms of SO₂ per joule heat input (1.2 lb. per million BTU) and a maximum limit of 10% of the potential combustion concentration derived from solid fuel. When emissions are less than 260 nanograms per joule heat input (0.60 lb. per million BTU), a maximum limit of 30% of the potential combustion concentration is required. Potential combustion concentration is based on equipment design efficiency.
- d. No flue gas discharged into the atmosphere will contain in excess of 340 nanograms of SO₂ per joule heat input (0.80 lb. per million BTU) and 10% of the potential combustion concentration derived from liquid or gaseous fuels.
- e. The nitrogen oxide emission limits for gases discharged into the atmosphere are identified in Table 2-2.
- f. The following fuels require the percent reduction of potential combustion concentration: gaseous fuels, 25%; liquid fuels, 30%; solid fuels, 65%.
- g. Activities will record fuel consumption and steam output monthly to calculate boiler efficiency.

2-3.3 The above emission limitation and percent reduction requirements are both determined on a 30-day rolling average.

2-3.4 Exclusions

- a. Particulate matter emission criteria above apply at all times, except during periods of start-up and shut-down.
- b. Sulfur dioxide emission criteria above apply at all times except during start up, shut down, or when emergency conditions exist.

2-3.5 Air Emissions Monitoring for New or Substantially Modified Sources. N/SM steam generating units or electric utility steam generating units rated greater than 100 million BTU/hr heat input will operate a properly calibrated and maintained continuous emissions monitoring system to measure:

- a. The opacity of emissions, except where gaseous or distillate fuels are the only fuels combusted.
- b. Nitrogen oxide emissions.
- c. The oxygen and carbon dioxide content of flue gases at each location where either sulfur dioxide or nitrogen oxide emissions are monitored will be determined in order to insure proper operating conditions and unit efficiency.
- d. Stack sampling from units rated greater than 100 million BTU/hr heat input will be conducted every five years in order to determine compliance with criteria specified in Sections 2.3.1 and 2.3.2.

2-3.6 Air Emissions Monitoring for Small Sources. N/SM steam generating units or electric utility steam generating units rated greater than 10 million BTU/hr but lower than 100 million BTU/hr heat input will operate a properly calibrated and maintained continuous emissions monitoring system to measure:

- a. Oxygen emissions; and
- b. Carbon monoxide emissions.

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Notes: For small boilers (less than 10 million BTU/hr heat input), an annual boiler tune-up is required.

2-3.7 New or Substantially Modified Incinerators. These criteria apply to N/SM incinerators that burn more than 50 tons per day of waste, or burn more than 10% (by weight) sewage sludge, or that burn medical waste.

- a. No flue gas will be discharged into the atmosphere, from any facility, which contains particulate matter in excess of 0.18 grams per dry standard cubic meter (g/dscm) (0.08 grains per dry standard cubic foot (gr/dscf)) corrected to 12 percent CO₂.
- b. Incinerators that process beryllium-containing waste, beryllium, beryllium oxide, or beryllium alloys will not emit more than 10 grams of beryllium into the atmosphere over a 24-hour period.
- c. Visible emissions will not exceed 20 percent opacity except for 6 minutes in a 60-minute period during start-up, shut-down or emergency where opacity shall not exceed 60 percent.

2-3.8 Ozone Depleting Chemicals including Chlorofluorocarbons (CFC) and Halons. These criteria apply to direct emissions of ODC into the atmosphere. Installations shall comply with the following requirements:

- a. Submit an annual ODC procurement/usage report in accordance with applicable service components directives, as required.
- b. Establish procedures to eliminate the unnecessary release of ODC to the atmosphere.
- c. Identify and prioritize ODC uses and applications to ensure available supplies meet mission-critical needs.
- d. Modify operational, training, and testing practices to minimize the emissions of ODC, when appropriate.
- e. Develop or adopt conservation practices such as recycling, reuse, dilution, and substitution, when appropriate and consistent with mission requirements.
- f. Adopt suitable substitutes when consistent with mission requirements.
- g. Establish contract review procedures to prevent or minimize use of ODC in existing and future systems.
- h. All repairs or services to non-tactical equipment/air conditioners will use commercially available refrigerant recycling equipment, operated by properly trained/certified personnel. Documentation on training or certification will be maintained at the installation level. These requirements do not apply to tactical vehicles.
- i. No activity will, in the course of maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration unit, intentionally vent any class I or class II CFC refrigerant (see Table 2-1).

2-3.9 Volatile Organic Compounds (VOC). Vapor degreasers in use will incorporate systems which minimize the direct release of VOCs into the atmosphere including, for example, the use of covered or refrigerated systems.

2-3.10 Motor Vehicles. These criteria apply to DOD-owned, non-tactical vehicles. Inspect all vehicles every two years to ensure that all factory installed emission control equipment is intact and operational.

2-3.11 Medical Waste Incinerators. Incinerators, regardless of size, will comply as follows:

- a. Visible emissions will not exceed 20 percent opacity, except for 6 minutes in a 60-minute period during start-up, shut-down or emergency where opacity shall not exceed 60 percent..

b. O₂ content will not exceed 7 percent from stack.

c. Refer to Section 8-3.8 for operating criteria.

TABLE 2-1A		
CLASS I OZONE DEPLETING SUBSTANCES		
Group I		ODP
CFC - 11	Trichlorofluoromethane	1.0
CFC - 12	Dichlorodifluoromethane	1.0
CFC - 113	Trichlorotrifluoroethane	0.8
CFC - 114	Dichlorotetrafluoroethane	1.0
CFC - 115	Chloropentafluoroethane	0.6
CFC - 500	Dichlorodifluoromethane-difluoroethane	0.738
CFC - 502	Chlorodifluoromethane-chloropentafluoroethane	0.307
Group II		
Halon - 1211	Bromochlorodifluoromethane	3.0
Halon - 1301	Bromotrifluoromethane	10.0
Halon - 2402	Dibromotetrafluoroethane	6.0
Group III		
CFC - 13	Chlorotrifluoromethane	1.0
CFC - 111	Pentachlorofluoroethane	1.0
CFC - 112	Tetrachlorodifluoroethane	1.0
CFC - 211	Heptachlorofluoropropane	1.0
CFC - 212	Hexachlorodifluoropropane	1.0
CFC - 213	Pentachlorotrifluoropropane	1.0
CFC - 214	Tetrachlorotetrafluoropropane	1.0
CFC - 215	Trichloropentafluoropropane	1.0
CFC - 216	Dichlorohexafluoropropane	1.0
CFC - 217	Chloroheptafluoropropane	1.0
CFC - 503	Chlorotrifluoromethane-trifluoromethane	0.599
Group IV		
Carbon Tetrachloride	Tetrachloromethane	1.1
Group V		
Methyl chloroform	Trichloroethane (all isomers)	0.1

TABLE 2-1B		
CLASS II OZONE DEPLETING SUBSTANCES		
HCFC - 21	Dichlorofluoromethane	
HCFC - 22	Chlorodifluoromethane	0.05
HCFC - 31	Chlorofluoromethane	
HCFC - 121	Tetrachlorofluoroethane	
HCFC - 122	Trichlorodifluoroethane	
HCFC - 123	Dichlorotrifluoroethane	0.02
HCFC - 124	Chlorotetrafluoroethane	0.02
HCFC - 131	Trichlorofluoroethane	
HCFC - 132	Dichlorodifluoroethane	
HCFC - 133	Chlorotrifluoroethane	
HCFC - 141 (b)	Dichlorofluoroethane	0.1
HCFC - 142 (b)	Chlorodifluoroethane	0.06
HCFC - 221	Hexachlorofluoropropane	

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HCFC - 222	Pentachlorodifluoropropane	
HCFC - 223	Tetrachlorotrifluoropropane	
HCFC - 224	Trichlorotetrafluoropropane	
HCFC - 225	Dichloropentafluoropropane	
HCFC - 226	Chlorohexafluoropropane	
HCFC - 231	Pentachlorofluoropropane	
HCFC - 232	Tetrachlorodifluoropropane	
HCFC - 233	Trichlorotrifluoropropane	
HCFC - 234	Dichlorotetrafluoropropane	
HCFC - 235	Chloropentafluoropropane	
HCFC - 241	Tetrachlorofluoropropane	
HCFC - 242	Trichlorodifluoropropane	
HCFC - 243	Didchlorotrifluoropropane	
HCFC - 244	Chlorotetrafluoropropane	
HCFC - 251	Trichlorofluoropropane	
HCFC - 252	Dichlorodifluoropropane	
HCFC - 253	Chlorotrifluoropropane	
HCFC - 261	Dichlorofluoropropane	
HCFC - 262	Chlorodifluoropropane	
HCFC - 271	Chlorofluoropropane	

TABLE 2-2
NO_x EMISSION LIMIT FOR NEW OR SUBSTANTIALLY MODIFIED
ELECTRIC STEAM GENERATING UNITS

	Nanograms per Joule	Emission Limits - lbs/million BTU
<u>Gaseous fuels:</u>		
Coal-derived	210	0.50
Other	86	0.20
<u>Liquid fuels:</u>		
Coal-derived and shale-oil	210	0.50
Other	130	0.30
<u>Solid fuels:</u>		
Coal-derived	210	0.50
Sub bituminous	210	0.50
Bituminous	260	0.60
Anthracite	260	0.60
Other	260	0.60